

Advanced Ceramics: 1988-1995

A select list of books, journals, reports,
AV materials and databases available in
the NIST Research Information Center (RIC)

"Advanced ceramics" or "Engineering or technical ceramics" refer to ceramic materials that are inorganic, that exhibit superior electrical, optical, mechanical properties, with dimensional stability under a wide temperature range. These characteristics make advanced ceramics ideal materials for electronics, electrical, and structural applications.

While ceramics have been used for more than three thousand years, advanced ceramics have been developed only in the past 40 to 60 years. Advanced ceramics are made largely by eliminating pores or defects in the materials by using high purity powder as a starting material, after carefully controlled processing, the resulting material contains a small number of defects and approaches the theoretical density. This "lack" of defects gives the material superior mechanical properties under a wide range of temperatures and environmental conditions.

There are many different classes of materials such as alumina, zirconia, silicon nitride, silicon carbides for structural applications; there are many inorganic compounds that are generally referred to as advanced ceramics such as various oxides, nitrides, carbides of various elements. Many of these are used in optical, opto-electronic, electronic and other functional applications.

For structural applications, ceramics possess superior hardness, strength, and high temperature capability. They are also corrosion and wear resistant. The drawback is that they are brittle and often fail catastrophically.

For functional applications, ceramics can have superior electrical insulation capability, optical stability, and dielectric properties. As such, they are widely used in electrical insulation, substrates for integrated circuits, and optical thin films.

Spurred by the aerospace and military requirements in the 50's, advanced ceramics were developed as a material of choice for high temperature applications. In the 60's, there was a trend to develop ceramics for commercial applications. But because of the high costs, ceramics have not been used widely in commerce. In the 70's, because of the oil shortage, various engine technologies were explored and the availability of ceramics for possible engines (i.e., highly efficient engines without coolant so that the temperature of combustion could be very high, hence thermodynamically efficient), research in ceramics increased dramatically.

Here at NIST, research in advanced ceramics is coordinated by the Ceramics Division of the Materials Science and Engineering Laboratory. Research programs in advanced ceramics include: ceramic powder characterization, phase equilibria studies, ceramic processing, surface properties of ceramics, electronic Ceramics, mechanical properties, ceramic machining, coatings, and opto-electronic materials.

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The following is a select list of books, journal titles, NIST reports, and AV materials published since 1988. Entries for the bibliography were chosen if one or more of the following terms were in the subject field: ceramics, advanced ceramics, or ceramic materials. This list is arranged by LC (Library of Congress) Classification System.

A list of databases which are available online or on CD-ROM is also included. For information on the use of these databases, ask at the Reference/Information Desk or call x3052.

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Advanced Ceramics: 1988-1995

Books, Journals, Reports, AV Materials

HC110.I52 I54 1989

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